



The Postdoc Association Interview: Dr. Bill Craig, Director of the LDRD Program



Dr. Bill Craig is the director of the LLNL “Laboratory Directed Research and Development” (LDRD) program. This program funds scientific projects that are variously described as “innovative” and “high risk,” and is a major source of funding for postdocs. Currently, our LDRD program funds about 150 projects with a total budget of roughly \$90M.

Bill met with the Postdoc Association for the fascinating and informative discussion that we present here. The following interview was conducted on March 26, 2012 by Adam Sorini and David Martinez. Photos and additional editing by Nathan Kugland.

Adam: According to our research, you joined the Lab as a postdoc in 1994...

Bill Craig: That’s actually not right, I joined the Lab as an undergraduate in 1987, worked here when I was a graduate student at UC Berkeley, and then finally joined the Lab officially as a postdoc in ’94.

Adam: We were going to ask, “What was the first project you worked on as a postdoc?” But, maybe you could talk about...

Bill: My background as a graduate student and as a postdoc was in high-energy astrophysics—so I worked on a gamma-ray imaging platform. High-energy astrophysics is a big thing here at the Laboratory, obviously. Gamma ray imaging is big for programmatic reasons, so that’s where I started. Berkeley was the science driver, but the Laboratory had the instrumentation so that is why I came down here.

David: Did you leave the Lab in between your postdoc and...

Bill: Many times. I had stints at Columbia University, UC Berkeley, and Stanford. I tend to leave and come back.

Adam: Why did you leave?

Bill: Because the focus of the science projects I’ve been involved in moves around.

Adam: Were you faculty at those universities?

Bill: I was a group leader at Stanford. I was a senior research scientist at Columbia. It was not a faculty to staff thing, but sometimes projects are just more easily done when you want to concentrate on them at the

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university. It is somewhat less expensive at the university, which is why I spent the last three years at Berkeley.

Adam: *Do you plan on leaving again?*

Bill: I have no plans on leaving.

Adam: *Is it easy to leave and come back?*

Bill: Yes it is actually. What I normally do is I go into indeterminate or indefinite status so I actually rarely leave the Laboratory completely, but I get paid elsewhere for a while. In my personal opinion, the Laboratory should have a freely opening door; it is good for people to go out and get experience with a university or industry and come back.

Adam: *Could you talk about how the Lab has changed since when you were first here?*

Bill: In my opinion it is now much more difficult to get technical work done in the NNSA laboratory system because of the security and safety issues that started making an impact in the early 2000's. However, that is starting to relax. I think it is actually better now than it has been in a number of years. The Laboratory itself hasn't changed all that much. It is still a broad matrix of people so you can always get anything done, if you have a vision. There are people around to make anything happen. This is not the case at a university, where you are certainly lacking certain skills. You may be lacking engineering or you may be lacking a certain physics specialty or whatever. And if you need it you have to hire it and you have to hire it in units of one person. You can't get 10% of a mechanical engineer whereas here you can easily get 10% of a mechanical engineer. So it is a much easier place to get things done modulo the difficulties with making sure you are doing it safely and securely.

David: *What is the LDRD program, in your opinion?*

Bill: I will give you more than my opinion; I will give you what it actually is. The Laboratory Directed Research and Development was initially proposed by Congress to do several things. The first was to make sure that the Laboratory continues to do cutting edge science, bringing in the best and brightest people, and pushing the boundaries so that the Laboratory has innovation out front. It is not intended to detract from the mission, but to augment the workforce and to make sure that the next generation of ideas is out there. Congress allows up to 8% of the Lab's budget to be devoted to LDRD research

that is not controlled by NNSA or DOE or Congress but instead by the Laboratory Director. It has certain rules that need to be followed and it's basically a reinvest. Some percentage of any organization should go into future R&D and for this organization 8% has been about right. The program is divided into certain pots, which you probably do care about. But the overall program is 8% of the taxable base. That means about \$95-\$97 million a year of research dollars and those are overhead dollars.

Adam: *Looking online they have some of the budgets since 2007, 2008, 2009, 2010 and it seems to be going down...*

Bill: It tracks the Lab's budget, of course. Fiscal Year '13 is projected to be flat only because there will be no budget because it is an election year, therefore we will have a continuing resolution. The Lab will do about the same, so we will plan for \$95-97 million. The size of the program is at the Director's discretion. Directors in the past have always generated the maximum and one presumes that this tradition will continue. Other laboratories in the system range between 4% and 7%. For comparison, Los Alamos is a \$2.2 billion dollar lab and they have a \$160 million dollar LDRD program.

David: *So what are the challenges and goals of the LDRD program? What do you foresee in the future and on what type of projects do you want to concentrate?*

Bill: There are 4 things that LDRD does. One of them is something that you could call "discovery" or "reputation." It is doing the best science for the sake of doing the best science. The reason for doing it is to expand your influence in the outside world to attract the best people and do the best science. Next, there are core competencies like high performance computing or high



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power lasers, things that the Laboratory is just known for. If you went anywhere in the world and you asked people, "Where would you go for high performance computing and simulation?" Livermore would be in the top 5 places named. So, there is core competency support, which we always invest in. Third, there is mission related group research. The Laboratory has its strategic plan of where it wants to go and has categories: bio security, cyber space situation awareness, intelligence, nuclear threat reduction, and the like. There is money set aside to invest in those areas and to do good cutting edge R&D, but in direct response to the strategic plan. Finally, there is something you'd call "initiatives" or "seedlings" where you are looking beyond any plan. You are looking out to the future and that category is a hodgepodge as you might imagine. There is actually a strategic focus category for that called 'Futures', where you are encouraged to propose things that might be important to the nation ten years down the line. One example is a project for asteroid deflection, not a mission for us unless we find an asteroid, but very appropriate for this Laboratory and thinking out in the future there may or may not be program growth there. LIFE (Laser Inertial Fusion Energy) is another example that might be very important some years down the line. Those four categories are guided by the five-year strategic plan, the "roadmap" to the future that was led by my boss, Tomàs Díaz de la Rubia, the deputy director for science and technology. It has been very successful and is continually being updated. There is an update that just went up on the web about a week ago that assembles the wisdom of the Laboratories senior management about the way the Lab wants to go. As postdocs what you will be most interested in is the fact that there is an investment in discovery science and broad latitude to look toward the future. LDRD is your vehicle to do that. I love to have Postdocs as LDRD PIs. In fact, about half of the PIs in the Lab Wide program are Postdocs.

Adam: *So, Postdocs can submit [LDRD] proposals?*

Bill: Yes. There are three categories of LDRD that matter. One of them is "Strategic Initiatives," which are large million-plus dollar proposals that are typically led by senior researchers, not postdocs. Then there's something called "Exploratory Research", which are the half million dollar to one million dollar budgets. A handful of those are led by postdocs. Then there is the "Lab Wide" category, which is three hundred thousand dollars, give or take, for which postdocs are especially

encouraged. The selection for Lab Wide proposals is made completely without management bias by the scientific peer-review process. The Lab Wide LDRDs are awarded to whoever has the best ideas, regardless of their experience or track record.

Adam: *That's three hundred thousand for three years?*

Bill: Three hundred thousand per year for two years with a possible extension to three years.

Adam: *So that will pay for more than just the postdoc himself...*

Bill: Yes, that's right. It will pay for the postdoc or, as you convert, it will pay for most of you, because you get considerably more expensive. This year there will be twelve to fourteen "Lab Wide" LDRDs selected and I expect something like one hundred proposals. The competition is fierce, but those aren't scary odds. It's the same odds you'd see if you proposed to NSF or NIH.

David: *Can you describe what makes a successful postdoc LDRD, and perhaps give advice about how to submit a successful proposal?*

Bill: There's actually a presentation on the web. Eric Gard, who runs the LDRD "Lab Wide" program, put a set of slides together about what makes a good proposal. They're available on the LDRD website which is <http://isto.llnl.gov> (internal network only). The number one thing is a good idea. The number two thing is a good idea. And the number three thing is: Don't screw it up when you write the proposal. Have something that's coherent, that people can understand, and that makes sense both technically and from a management perspective.

Adam: *And the proposal for the "Lab Wide" is due on April...?*

Bill: The due date is Monday, April 23rd, 2012 for "Lab Wide" proposals.

Adam: *So the postdoc, if he is writing up his proposal, has to put together a budget himself?*

Bill: With the help of a Resource Administrator (RA). All you have to do is go to your group leader, go to your management, go to somebody who's been here a while, and they'll put you in touch with an RA. It's pretty straightforward. Then just read the slides. Talk to Eric [Gard] if you want to. Talk to me. I'd be glad to give you my thoughts. I had a "Lab Wide" at one point.

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David: *What type of LDRD projects can you say off the top of your head that were a spectacular success?*

Bill: Well, it depends on what you define as a success. Some projects are specifically designed to produce a technology. In the past there was a series of LDRD proposals on adaptive optics: How do you change a telescope lens to sharpen up the images? That technology development ended up developing the field of adaptive optics, which is now in use in basically every telescope in the world. More recently there have been LDRD investments in the NIF optics. There was a research effort which went on here to look at the physics of optics damage which has been extraordinarily successful—NIF now runs at higher power than designed with optics that last far longer than originally anticipated. In fact that's one of the reasons you can even think about something like LIFE where you blast things at ten hertz... If you were blowing up optics once every few shots that wouldn't have worked.

Adam: *Let's go to the flip side of that. These are high-risk proposals... Do you have any examples of big flops?*

Bill: That's an interesting question because it's something I've struggled with. I came back in September of 2011, and one of the questions that I immediately asked when I got back is: What is the risk balance in the portfolio? How risky is it? I think that we hadn't been

specific enough about our willingness to embrace risk and technical challenge. The Laboratory, as you may have noticed, is a success-oriented place. In some sense that's always true of research, because when you do research you make advances. The Director specifically asked for high-risk proposals in this year's call for proposals, because he understands that if you don't have some examples of failures then you aren't reaching far enough. There are certainly projects which haven't achieved their original goals, but that is all right. A failure of concept is acceptable. A failure of execution is not good. All projects have risk of doing that because all projects are hard. But stretching for technical risk is OK because you reached out there and you almost certainly end up producing something that will build the base of knowledge.

David: *How can a postdoc be successful in the Lab in general and how could a postdoc branch out into other careers outside the Lab or a permanent position inside the Lab?*

Bill: The number one way that a postdoc succeeds here is to get exposure and network. That's why the postdoc association is so important because it gives you exposure to other parts of the Laboratory. The advantage of being at a place where you've got 3000 technical people is that it allows you to see what's happening in other areas and find an area which either appeals to you, or you can create your own area because you have the technical background to do it. Understand where you might fit it. You do that by going to talks, you find a mentor, or you find two, and work with them to understand what the Laboratory is about and how it works for you. One of the services the Lab provides to the nation is training multidisciplinary scientific researchers and making people who understand how to bring teams together or how to bring disciplines together. Getting out to talks or listening to LDRD town hall meetings is a great way to succeed. There are over two hundred postdocs now, the largest number of postdocs in history and that's great, but not everybody's going to stay. Those who stay will succeed by finding out where the opportunities are. A "Lab Wide" LDRD is a great thing to have because it shows that you can come up with a good idea, you can explain it, you can sell... seeking support is good.

David: *How did you move into management—*

Bill: —why would I do something that stupid?

All: [Laugh]

Bill: Well... I was out managing a satellite project and

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that project was going to move into a phase where it does science. And there's nothing to manage at that point. I wanted to do science, but right around that time the LDRD Director position became available and I interviewed for it because I believed so strongly in the program. I think it's absolutely essential to the success of the Laboratory that the LDRD Director job is done with some continuity and some idea of where to go in the future. I think the LDRD program is really vital to the Lab and I've benefited a lot from it so it's a good way to give back, and the timing worked out.

Adam: *Here's a difficult question: what is your favorite color and favorite fruit, which is also that color?*

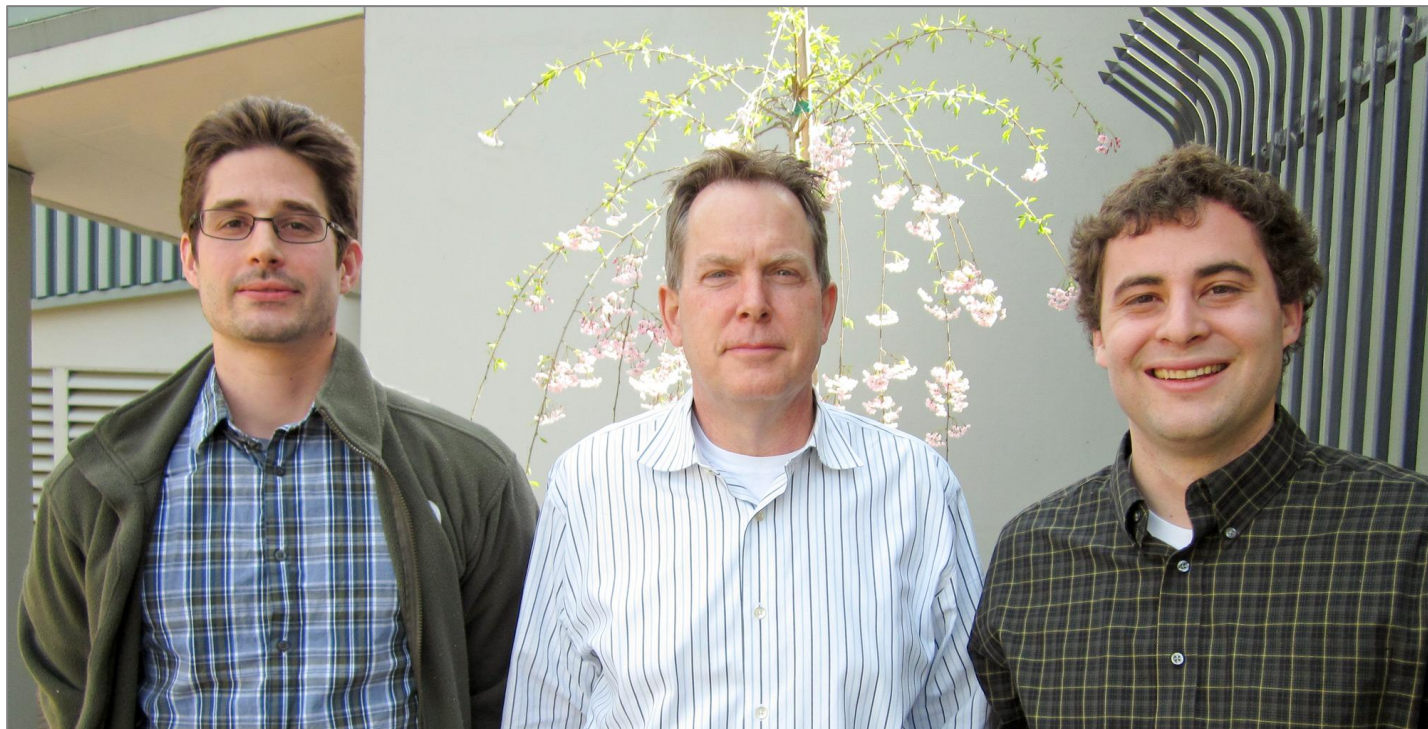
Bill: [without any hesitation] Green grapes.

David: *What do you find most exciting about the project NuSTAR, and if a postdoc were interested in participating, how would they go about getting involved?*

Editor's note: NuSTAR stands for "Nuclear Spectroscopic Telescope ARray." Dr. Craig is an astrophysicist by training, and he is the Instrument Manager for NuSTAR. Read more about the project here: <http://www.nustar.caltech.edu>

Bill: What an excellent question that is! NuSTAR will, because it operates in a band of energies from 6kV to about 80kV, see things that have never been observed, with a focusing telescope that allows you to get high sensitivity. It has an enormous discovery potential. The most exciting things it does are: survey black holes at the edge of the universe; look at how black holes are linked to the formation of galaxies and structure in the universe; look at exploding stars and what's produced there. The compact objects (neutron stars, black holes) are the special interest of a group over in Physics. Mike Pivovarov and Julia Vogel, who may still be a postdoc, did work on the optics calibration for NuSTAR and they're interested in performing observations and trying to analyze data over the next year. The NuSTAR data will eventually go public but for the first six months to a year it's going to be kept within the science team, so there's a good opportunity over the next year and anybody who's interested should talk to me. It'll be fun.

Thank you, Dr. Craig.



Postdoc Enters AAI Fellow Program

Postdoc Dina Weilhammer (postdoc in PLS/Biosciences and Biotechnology Division) was accepted into the American Association of Immunologists' (AAI) Public Policy Fellows Program. The goal of this program is to help strengthen AAI's public policy efforts by engaging Post Doc fellows in a year-long program that explores how legislative activities impact funding of bench research. For a full description of the program, please see http://aai.org/Public_Affairs/PPFP?Program.html. Congratulations to Dina for this great accomplishment. It aligns very nicely with the Lab's role in doing science for the national interest.



Postdoc-Related Highlights from Notes to the Director

"Hot" electron generation for fast-ignition

Fast Ignition (FI) is an approach to inertial confinement fusion in which a pre-compressed deuterium-tritium fuel capsule is rapidly driven to ignition by an external energy source. In principle, FI would allow ignition at lower fuel densities, leading to gains that are higher than possible with conventional hot-spot ignition. One concept for FI uses an intense, short-pulse laser to generate a stream of energetic ("hot") electrons at the tip of a hollow cone embedded in the fuel capsule. These electrons can then propagate to the compressed fuel core and "spark" ignition in the fuel. However, the plasma formed in the cone by the pre-pulse inherent to short-pulse laser systems can strongly affect the characteristics of the laser-generated hot electrons. A recent paper by NIF postdoc **Tammy Ma** and colleagues from the Lab, UC San Diego, Ohio State University, and General Atomics, describes the effect of increasing pre-pulse energy on the energy spectrum and directionality of the resulting "hot" electrons. Using simulations and experiments performed on the Titan laser at the Lab's Jupiter Laser Facility, the team found that the overall conversion efficiency of laser light into electrons that could potentially contribute to the ignition of a pre-compressed fuel capsule fell from 7.1% to 2.5% as the pre-pulse energy rose from 8 mJ to 1000 mJ. More importantly, the conversion efficiency into the 1–3 MeV electrons that are most effective for FI dropped from 0.57% to 0.03%. These results highlight the need to

Upcoming Events

Pizza Lunch with Tomás Díaz de la Rubia, Deputy Director of Science and Technology

Monday, April 23, 11:45 AM, LVOC Yosemite Room
Join the IPPB and the Postdoc Association for a town-hall style meeting. Please bring your questions for Tomás!

PLS Special Seminar: Panel Discussion with Recently Converted Postdocs

Tuesday April 24, 1-2:30 PM, Stevenson Room B151
Sonia Wharton (AEED), Xavier Mayali (CSD), Sean Ford (AEED) and James Lewicki (CSD) will talk about their postdoc and recent FX-term experience. After they speak, we will open it up for questions. The discussion will focus on what the former postdocs did that they feel positioned them for a flex-term position, what skills they felt were important, positive and negative experiences, advice, and so forth.

minimize pre-pulse levels in order to optimize the yield of hot electrons able to couple to the fuel in FI-ICF designs. This paper was selected as an "Editor's Suggestion" for Physical Review Letters. "Suggestions" are selected on the basis of the potential interest in the results presented and on the success of the paper in communicating its message, particularly to readers from other fields.

<http://link.aps.org/doi/10.1103/PhysRevLett.108.115004>

Frédéric Pérez wins EPS Plasma Physics Ph.D. Research Award

LLNL postdoc Frédéric Pérez, working with Prav Patel on fast ignition, is one of three recipients of this year's Ph.D. Research Award from the Plasma Physics Division of the European Physical Society (EPS). The EPS PhD prize is given in recognition of exceptional quality work carried out by a young scientist. Pérez' award was for his doctoral thesis on "Study of supra-thermal electron transport in solid or compressed matter for the fast-ignitor scheme." His results showed that in some experimental conditions fast electrons can be collimated due to self-generated magnetic fields produced by resistivity gradients. This may have important implications for the feasibility of the fast ignition approach to inertial-confinement fusion. The award will be formally presented at the opening of the forthcoming 39th EPS plasma physics conference, which will be held in Stockholm, Sweden, on July 2-6, 2012.

Notes from LLPA Council Meeting on Wednesday, April 4, 2012

Start 12:00 PM, B123 Conference Room. Attendees: Kris Kulp, Christine Zachow, David Martinez, Julia Vogel, Jamie, Lance Simms, Andre Schleife, Kirsten Howley, Nick Be, Eric Wang, Charles Reid.

1. Vine Movie Event

+Kirsten has a good handle on everything. She will order an appropriate amount of hot dogs and pizza from Costco. She and Kris will pick it up before the movie.

+Kris and Christine will work on finding folding tables to use for the food and registration.

+Kris and Christine will procure name tags for the event.

+Lance, Charles, and Christine will set up before the show.

+Julia and Christine will take care of registration and collecting money. They plan to bring change.

+Kirsten and Christine will figure out the speaker for after the movie (if we don't get one, it is ok)

We will be there at 6:00 and try to get in as early as possible. From approximately 6:35 to 8:55, we will try to stick to Kirsten's schedule.

2. T-Shirt Contest

We are ordering 200 shirts (99 were requested by postdocs, 101 are for extra)

The cost without tax or shipping is \$1516.28. We will have \$1684 to spend on the shirts after money is collected.

+Christine will check on whether we are "tax exempt" for the t-shirts

+Once we figure out whether or not we are tax exempt, we will get an official invoice (Lance)

+Money will be collected in the cafeterias Thursday and Friday (4/5 and 4/6). Andre, Nick, and Lance are collecting. They will keep a record of who paid and send it to Lance along with the cash.

3. Interviews and Newsletter

Bill Craig and Tomas were interviewed this week.

It went very well and David M. and Adam are in the process of transcribing the recording. They anticipate it will be in an upcoming newsletter.

Upcoming feature articles will be outreach for girls (Heather W.) and martial arts (Adam S.)

4. Postdoc Space

We have two options: the central cafeteria and the library. We will start off with the cafeteria and see how it goes.

+Charles is going to schedule a tea-time in the next few weeks.

5. Website

R&R for the newsletters is coming along. We have identified an ADC to do it.

+Charles and Abhinav will schedule a meeting to discuss the next steps with the web pages. There will be short term items like getting the newsletters and handbook on the site and longer term items like reorganizing content and design.

Charles made some good suggestions about a content management system like Drupal so that it can be passed on to future postdocs easily.

+Kris and Christine will look into getting an account number for some of us to work on this.

6. Happy Hour and Lunch

Andre was satisfied with the last postdoc lunch and will schedule another for the following month. He will try to schedule a happy hour for later this month.

7. Brown Bags

Upcoming Brown Bag with Tomas is on April 23.

+Andre will help pick up the pizza beforehand.

8. Updated Mission Statement and Responsibilities

+Lance will focus on this once the order has been submitted for the t-shirts.

If you have an issue that you want to bring to the attention of the postdoc community, or you're just interested in being more active here at the Lab, then we'd love to have you come out to our next meeting. Contact Lance Simms (simms8@llnl.gov) for info.

Comments/Suggestions/Praise/Complaints? Your Participation is Welcome!

Please send your comments or questions to the Editor (Nathan Kugland, kugland1@llnl.gov).

Selected Recent Research Publications by LLNL Postdocs

Bold = LLNL Postdoc. *Broadcast your achievements! Make new connections & help show how we are doing collectively.*

Guidelines: 1) Peer-reviewed publications only, nothing in progress; 2) Your affiliation must be LLNL; 3) Prepare a standard-format citation with all authors (no *et al*), the full title, and journal/proceedings info; 4) Note which authors are LLNL postdocs, and in what division & group; 5) Send all of this to Nathan (kugland1@llnl.gov).

NIF/Plasma Physics: **T. Ma**, H. Sawada, P. K. Patel, **C. D. Chen**, L. Divol, D. P. Higginson, A. J. Kemp, M. H. Key, D. J. Larson, S. Le Pape, A. Link, A. G. MacPhee, H. S. McLean, Y. Ping, R. B. Stephens, S. C. Wilks, and F. N. Beg, "Hot Electron Temperature and Coupling Efficiency Scaling with Prepulse for Cone-Guided Fast Ignition," *Phys. Rev. Lett.* 108, 115004 (2012), <http://link.aps.org/doi/10.1103/PhysRevLett.108.115004>

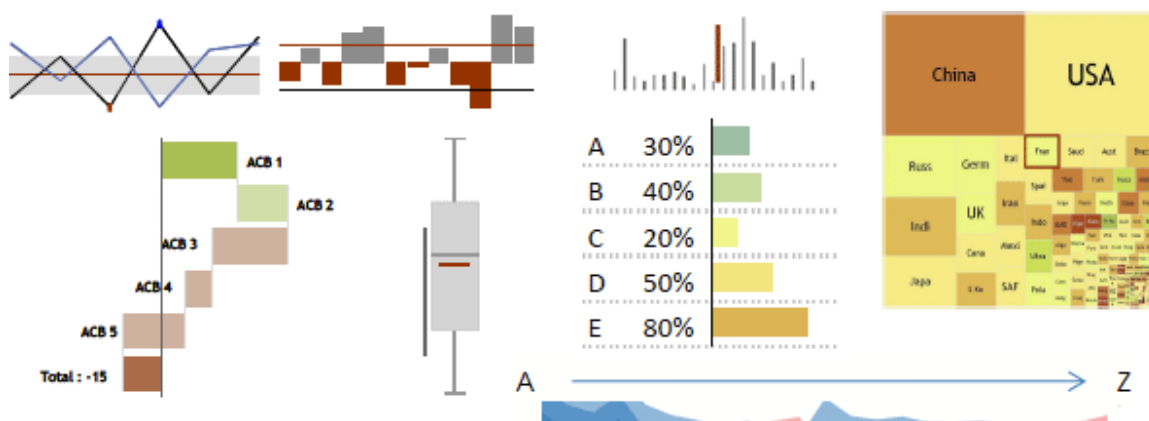
PLS/AEED/Computational Geosciences Group: **Pengcheng Fu**, Yannis F. Dafalias (2012), "Quantification of large and localized deformation in granular materials," *International Journal of Solids and Structures*, doi: 10.1016/j.ijsolstr.2012.03.006.

Sparklines for Excel: Compact Visualization Tools that Will Rock Your Data

Sparklines are compact, quantitative graphics (miniature plots, if you will) that were pioneered by Edward Tufte to rapidly visualize numeric data. The latest versions of Excel have a few of these built in, but they are limited and only work in the new .xlsx files. Enter "Sparklines for Excel," a free add-in that makes sparklines and much more, for new and older versions of Excel. <http://sourceforge.net/projects/sparklinesforxl/>

Shown below are some samples of the output. Clockwise from top left: line charts, bar charts, spread charts, tree maps, area charts, individual horizontal & vertical bars, box plots, and cascade charts. Sparklines for Excel also makes awesome heat maps, pie charts, and scatter plots (not shown).

—Nathan Kugland



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